PRELIMINARY DEVELOPMENT PLAN FOR UTAH TRACT U-b SUBMITTED IN ACCORDANCE WITH THE DEPARTMENT OF INTERIOR'S PROTOTYPE OIL SHALE LEASING PROGRAM

#232

PRELIMINARY DEVELOPMENT PLAN FOR UTAH TRACT U-b SUBMITTED IN ACCORDANCE WITH THE DEPARTMENT OF INTERIOR'S PROTOTYPE OIL SHALE LEASING PROGRAM

SUBMITTED TO THE LEASE SALE OFFICER,

UTAH STATE OFFICE

BUREAU OF LAND MANAGEMENT,

U.S. DEPARTMENT OF INTERIOR

BY

WHITE RIVER SHALE OIL CORPORATION

April 1974

SOHIO PETROLEUM COMPANY

300 ENTERPRISE BUILDING
THIRD AND MAIN STREETS
GRAND JUNCTION, COLORADO 81501
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H. PFORZHEIMER
VICE PRESIDENT

May 30, 1974

Mr. Henry Ash
Oil Shale Environmental Advisory Panel
Building 67, Room 820A
Denver Federal Center
Lakewood, Colorado 80225

Re: Preliminary Development Plan
U-b Federal Lease

Dear Mr. Ash:

Attached for the information of the Oil Shale Environmental Advisory Panel is the preliminary development plan for the U-b lease which has been awarded to the White River Shale Oil Corporation for its high bid of $45,107,200. This corporation is owned equally by Phillips Petroleum Company, Sun Oil Company and Sohio Petroleum Company, a subsidiary of The Standard Oil Company (Ohio).

Representatives of the White River Shale Oil Corporation will be in attendance at your meeting scheduled for Vernal on June 12 and 13. We are looking forward to this opportunity of reviewing the preliminary development plan for you and of obtaining your critique, comments and questions. Our dialogue at this and future meetings will help us accomplish our objective of minimizing the socio-environmental impacts from development of the Utah oil shales.

Sincerely,

H. Pforzheimer

H. Pforzheimer, President
White River Shale Oil Corporation
300 Enterprise Building
Grand Junction, Colorado 81501

cc: Robert McClements, Sun
William Bohon, Phillips
John L. Ross, Sohio

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PART 1: INTRODUCTION AND GENERAL SUMMARY

INTRODUCTION

This Preliminary Development Plan is submitted by the White River Shale Oil Corporation as lessee of Utah tract U-b, in accordance with instructions published by the Department of Interior in the Federal Register Vol. 38 No. 230, November 30, 1973. The oil shale lease on Utah tract U-b was awarded to the White River Shale Oil Corporation as lessee, after a high bid of over $45 million. By virtue of that contract, the lessee is vested with certain rights and interests in the land. Section 2 of the Oil Shale Lease concerns specific grants made to lessee and provides expressly that:

> "The Lessee is hereby granted, subject to the terms of this lease, the exclusive right and privilege to prospect for, mine by underground or surface means and process by retorting or by in situ methods or otherwise, as he may reasonably choose and in accordance with approved plans, utilize, and dispose of all Leased Deposits together with the right to construct on the Leased Lands all such works, buildings, plants, structures, roads, powerlines, and additional facilities as may be necessary or reasonably convenient for the mining, processing, and preparation of products of the Leased Deposits for market and the housing and welfare of the Lessee's employees, agents, and contractors, and to use so much of the surface of the Leased Lands as may reasonably be required in the exercise of the rights and privileges herein granted."

In pursuance of the rights and interests granted, and in conformance with the requirements of the applicable regulations, this Preliminary Development Plan is submitted.

The White River Shale Oil Corporation is a Delaware corporation, and hereafter in this plan will be referred to as Lessee (U-b). Lessee (U-b) understands that this plan is required for the lessor's guidance in establishing initial supervision of activity on tract U-b. The plan is submitted with the understanding that it is neither binding on Lessee (U-b) or the lessor and, of itself, does not authorize any action by Lessee (U-b). This plan should be viewed as a preliminary plan subject to modification as additional information is developed.

Part 2 of the plan concerns the development of Utah tract U-b, and consists of the following sections:

I. Method of Development

II. Proposed Location of Facilities

III. Schedule for Development

Part 3 is concerned with the oil shale lease environmental stipulations and outlines a preliminary plan for attaining the criteria established for environmental monitoring and protection. Part 3 is divided into the following sections:

I. Baseline and Monitoring Programs

II. Environmental Planning

III. Environmental Reporting

An Appendix contains a map of the U-b area and diagrams that are referred to in the plan.

It is important to note that the plan submitted for tract U-b is a preliminary plan that will be modified as additional data and

and information becomes available. It is the intent of Lessee (U-b) to generally discuss the development of tract U-b realizing that a great deal of additional information is required to prepare the final plans which will be disclosed in the Detailed Development Plan. In many cases alternative courses of action are discussed, and it should be understood that new alternative cases likely will be developed as environmental, economic, and operating parameters are more fully investigated.

GENERAL SUMMARY

The oil shale deposits on tract U-b will be mined by underground room-and-pillar mining. This approach offers the most proven and reliable plan for rapid development of oil from shale. The mined shale will be transported to the surface by either a vertical or inclined shaft and conveyed to the refinery plant site for retorting and upgrading. Refinery capacity of 50,000 B/D of product is currently planned; this will require mining approximately 80,000 tons/day of oil shale. Retorted shale will be disposed of above ground; a comprehensive revegetation and rehabilitation program will be developed to minimize environmental impact of the retorted shale disposal.

Preliminary plans call for exploration and environmental baseline monitoring from mid-1974 through 1976. Lessee (U-b) expects to submit detailed development plans and obtain approval of these plans by January 1, 1977. This will enable construction activity to begin in early 1977 and continue through 1979. Under this accelerated timetable, oil production could begin in early 1980.

Joint development of adjacent tract U-a is viewed as a probable approach, and where possible, this joint approach is indicated in alternative courses of development.

PART 2: DEVELOPMENT ACTIVITIES

SECTION I - METHOD OF DEVELOPMENT

A. Oil Shale Mine Development

An underground mine of the room-and-pillar type will be utilized to develop oil shale activities on tract U-b. We believe that this approach has an important advantage in that underground room-and-pillar mining represents the only proven and available mine technology (exclusive of strip mining) that is currently available for oil shale development. We believe that underground mining also represents the most reliable and quickest approach to developing and maximizing the yield from Utah's oil shale reserves. This approach offers the advantage of early development by conventional mining, yet does not preclude the eventual utilization of the mine for advanced recovery techniques.

The mine on U-b will be designed to produce raw shale to support a plant of approximately 52,000 B/D capacity. This requires the mining of over 25 million tons per year of oil shale yielding approximately 30 gal./ton of oil.

Two alternatives have been studied for opening up the underground mine; vertical shaft entry, and inclined shaft entry. In the vertical shaft concept, three shafts are required to develop the mining operations. The production shaft is expected to be a 30 ft. diameter (ID) concrete-lined shaft and will extend to a depth of 1,300 feet. The shaft will require two years to complete; it will initiate the mine construction and development period. The production shaft

will carry all service facilities (water, electricity, fuel oil, etc.) in pipelines buried in the concrete lining. Transport of the shale to the surface will be by four bottom dump skips. Two hoists (each with 2 skips) will provide the hoisting capacity for raising approximately 500,000 tons of shale per week to the surface. The bottom 340 feet of shaft allows for installation of an underground primary crushing station with 2 large ore passes to the station from the mining level.

The men-and-materials shaft will be a 20 ft. inside diameter concrete-lined shaft extending to a depth of 1,050 feet, including a sump beneath the mining floor. A large hoisting cage will nearly fill the circular shaft in order to minimize dismantling of relatively large pieces of mining equipment. No services are included in the shaft concrete lining. Adjacent to the surface entrance of the men-and-materials shaft, a changehouse will be constructed.

Near the underground base of the men-and-materials shaft, a shop facility for the maintenance of mining equipment will be constructed. An underground warehouse will be centrally located in the underground shop area. This is considered to be a satellite of a central surface warehouse.

A ventilation shaft with a diameter of 30 feet (ID) will be required to move approximately 2,500,000 cfm of air underground. Design criteria utilized to develop this ventilation requirement are based on the necessity of 100 cfm per diesel horsepower underground. The shaft will be sunk to a depth of

1,000 ft. and will be concrete lined. The large ventilation requirement will necessitate heating the intake air during the winter season to provide appropriate working comfort in the mine. The ventilation shaft will require one year to complete, with completion coinciding with the completion of the production shaft.

An alternative mining development approach is the entry to the underground mine via inclined shaft. Using this approach, an inclined shaft (-13° to -16°) would be driven for major access to the underground mine. The inclined shaft would contain a double roadway with concrete floor, conveyor belt for transport of crushed shale, and all utilities to the mine. At the base of the inclined shaft, an area would be excavated for the primary crushers, shops, and underground support facilities. The production conveyor belt would extend to the base of the crushed ore pocket.

Ventilation air for the inclined shaft approach would be provided by driving vertical ventilation shafts to the mine area. A second vertical shaft would be required for production mining, and would be equipped with an automatic elevator and additional utilities (as required).

Production drilling will be done by self-contained jumbo units. Each blast hole will be pneumatically loaded with ammonium nitrate and fuel oil mixture. Charging will be performed from an elevating platform unit capable of covering the entire face from a single set-up. Blasting will be conducted during the shift change.

The broken shale will be loaded onto 75-ton trucks by a diesel powered front end loader for transport to the primary crusher at the base of the production shaft. The number of trucks working with a loader could vary from two to four depending upon the distance between the working panels and the dump point.

Following the load-haul portion of the mining cycle, the newly exposed face, ribs, and back are scaled to produce a safe working area. A modified hydraulic excavator will be used to rake or pry loose material from the mine walls and roof.

B. Additional Mine Support Requirements Are Itemized Below:

1. Roof-bolting - Self-contained diesel powered jumbo roof-bolters will be used to perform the required bolting. Each rig will be equipped with two drill machines and will be capable of covering a 750 sq. ft. area from a single set-up.

2. Supply Handling - A partitioned tanker truck will deliver fuel, water, and hydraulic oil. Two additional supply trucks will deliver operating supplies such as roof bolts, drill steel, and bits.

3. Mine Road Construction - A portable crushing plant on the surface will provide crushed oil shale to the desired specifications for road construction. The crushed material will be returned to the mine through a small drill hole.

4. Road Maintenance - Main haulage roads will be graded as necessary and sprinkled to control dust. An underground surge tank will fill the sprinkler truck.

5. Muckpile Wetting - Muckpile wetting will be done with the same tank truck that is used for mine road sprinkling. Some water will also be sprayed on the back and ribs to control airborne dust.

6. Utility Loader - A mine clean-up loader (utilized for scaling clean-up, spilled rock clean-up, etc.) will be operated on a continuous basis.

7. Rescaling and Bolt Retensioning - This work will be conducted on an as-needed basis; no additional equipment is required. Roof bolts on haulageways likely will be retensioned one year after installation.

8. Power Distribution - An underground power service will enter in the concrete lining of the production shaft. The power network voltage will be reduced as needed at points of usage.

9. Communication System - Underground communication will be via low frequency 2-way radio.

10. Mine Dewatering - Our preliminary mining study provides for pumping capacity of 2,000 gpm. We do not expect to encounter substantial sources of ground water in the mine. Drilling during the exploration stage will provide additional information on ground waters on tract U-b.

11. Additional Service Vehicles - Service trucks will be provided for mechanics, electricians, and lubrication use. An ambulance is also included for mine use. Diesel powered vehicles are specified where possible.

C. Shale Transport

The crushed shale will be hoisted to the top of the production shaft at a projected rate of approximately 500,000 tons per week. The shale will then be transported via conveyor belt to the plant site. In the inclined shaft plan, a conveyor belt will transport the crushed shale to the surface and eventually to the plant site. In both approaches, a crushed shale storage pile will be maintained to provide the retorts with uninterrupted supply. From the storage pile, the oil shale will be conveyed to the secondary crushers and finally to the retorts.

D. Shale Crushing Facilities

The Paraho retort process described in following Section I-E, Part 2, requires that shale be crushed and sized to -3", +1/4". Two crushing systems are required. The primary crushers are underground at the base of the production shaft. The additional crushing is done on the surface at the plant site by at least six secondary crushers. The secondary crushers and appropriate screening will provide the -3", +1/4" sized oil shale feed to the Paraho retorts. Our preliminary studies indicate that the fine material passing through the 1/4" screen may not be an acceptable feed material for the

Paraho retorts. Three options are currently being considered to handle the undersized oil shale:

1. Discard the undersized material without retorting. It is likely that the material would be trucked to the retorted shale disposal site. The actual percent of fine material discarded in this approach is currently not known, but is expected to be a small amount.

2. Briquett the undersized material and feed directly to the retort.

3. Develop or adopt a retorting approach for this fine material such that briquetting or additional preparation is not required. This may involve use of a TOSCO II retort for fines retorting.

The detailed development plan will specify which of the above options has been selected. Some of the determining factors are the amount of undersized material to be generated and the results of the prototype Paraho retort testing program currently in progress.

The retorting plans disclosed later in this preliminary plan indicate that a relatively coarse shale feed can be utilized in the Paraho process. Assuming that the Paraho retorts are used, no tertiary crushing of shale is required. However, if the TOSCO II retort process is used, a tertiary crushing operation will be conducted at the plant site. Using this contingency, secondary and tertiary crushing operations are necessary to

produce -1/2" material for the TOSCO II process.

On the basis of anticipated Paraho technology, the shale will be drawn on conveyor belts from beneath the coarse shale storage pile, conveyed to the secondary crushers and fed to a retort surge bin for retorting. Particulate matter emissions from the crushers will be controlled, and the entire crushing operation will be enclosed to control noise and to reduce fugitive dust emissions.

E. Retorting Facilities

Lessee (U-b)'s preferred technology for retorting is the Paraho retort technology. It must be acknowledged that this technology is currently under development for shale oil by the Paraho Development Corporation. This 30-month program will be completed by February 1976; however, commercial design work likely can be initiated prior to the conclusion of the program.

Preliminary engineering evaluations indicate that use of the Paraho technology has economic, operating and environmental advantages for oil shale use. The economic advantages of the Paraho retort include a significant reduction in the capital investment for retorting equipment. These economic advantages of the Paraho retort have been proven in limestone application and it is the goal of the Paraho Development Corporation to adapt this technology to retorting of shale oil.

Our preliminary engineering studies also indicate that the Paraho retort may provide operating advantages over other retorting processes. These advantages include lower retort

pressure drop, lower labor costs due to the ability to automate, and lower maintenance costs due to mechanical design simplicity.

The environmental advantage of the Paraho process is primarily in the coarse shale utilized in the retort. Crushing of the raw shale to a fine particle size is not required and therefore the need for dust control is decreased to manageable proportion. This will be an important advantage in shale transport, storage and disposal. The linear grate at the bottom of the retort operates as a bulk displacement device, and very little break-up of this lump material in the retorting process is anticipated. This will be a decided advantage in retorted shale disposal as it will minimize erosion and fugitive dust production, while likely increasing the stability of the retorted shale after compaction. Additional information on the Paraho Development Program can be obtained from their offices in Grand Junction, Colorado.*

Recognizing that the Paraho technology is in a developmental phase for shale oil use (it is proven for use in limestone), Lessee (U-b) also includes in this preliminary plan the contingency for use of retort technology based upon the TOSCO II indirect fired kiln technology.

Lessee (U-b)'s preferred retorting plant will consist of 6-8 Paraho retorts each with a diameter of 40-60 ft. We anticipate that these retorts will be direct fired with recycle gas produced by the retorting operation. The crushed and sized (-3", +1/4") shale will enter the top of the retort and gradually pass downward through the unit. The shale will be

* The Enterprise Building at 3rd and Main Street.

gradually heated to 900°F in order to drive off the kerogen in a vapor mist form. The overhead retort products will be completely contained and separated into a gas and raw shale oil product. The light gaseous products produced by retorting are low BTU gases (approximately 100 BTU/SCF). A portion of this low BTU gas will be recycled to the Paraho retort for direct firing. A major portion of this gas will be available for fueling furnaces at the refinery. The retorted shale will be discharged out the bottom of the unit. The retorted shale will be transferred to the disposal area by truck and/or conveyor belt.

F. Disposal of Retorted Shale

Our preliminary plans indicate two proposed sites for disposal of retorted shale. The general plan calls for a conveyor belt and/or trucks to carry the retorted shale to the general vicinity of the disposal site. Final transportation is by bottom dump hauler-type trucks. Spreading will be accomplished while dumping and by grading. The required compaction is attained by driving over the area with hauler trucks and spreading equipment. On the sloped and terraced areas of the pile, compaction equipment may be required. There may be some intermittent streams in the area that require culverting and/or damming. The primary purpose of a dam or culvert is to prevent erosion and to contain leachate from the retorted shale pile. Such a procedure may also serve as a source of process water for vegetation uses and dust control. Consideration is also being given

to underground disposal of retorted shale. Under such a plan, the retorted shale would be disposed of in areas of the mine that have been completely mined and where no further activity is anticipated. As much as 60% of the retorted shale might be disposed of in this manner. However, suitable mined-out areas are not expected to be available for a minimum of 3-5 years after production mining begins, and detailed engineering and economic studies must be completed before this can be judged as a feasible alternative.

G. Upgrading of Shale Oil

A 50,000 B/D plant to upgrade the shale oil from the retort likely will be constructed. Two processing options are currently under consideration:

1. Production of a Synthetic Crude Oil for further refining at a conventional refinery.

2. Production of a low nitrogen, low sulfur distillate fuel for home heating, peaking turbines, or diesel-power usage.

Production of a distillate fuel is currently regarded as the alternate most likely to be chosen by Lessee (U-b). The refinery will receive 52,000 B/D of raw shale oil from the adjacent retorting facility. The raw shale oil will be stored in insulated floating roof tanks adjacent to the refinery area. An overall site plan and a preliminary flow diagram is in Appendix A and B, respectively. The basic units in the refinery are a distillation column, hydrogenation units,

coker, ammonia plant, and sulfur plant. Extensive hydrogenation facilities are required to catalytically hydrogenate the oil to remove nitrogen and sulfur compounds. The nitrogen compounds are converted by catalytic hydrogenation to ammonia; the sulfur compounds are converted to hydrogen sulfide. The two compounds are selectively stripped to separate the NH_3 and H_2S. The H_2S will be directed to a standard Claus sulfur plant for conversion of the H_2S to elemental sulfur. The tail gas from the sulfur plant will be subsequently treated to reduce SO_2 emissions to the lowest practical level. Production of elemental sulfur from the sulfur plant will approach 45 long tons per day. Normally, elemental sulfur produced from a Claus plant is of sufficient quality such that the sulfur should be a saleable by-product of the plant. Additional market research will be required to determine if a market is likely to develop in the plant's geographical area.

Similarly, ammonia will be produced as a by-product at the anticipated rate of 100 tons per day. A market for the material will be sought within the geographic area. A limited amount of ammonia might be used internally as a fertilizer as part of the revegetation/rehabilitation program.

The heavy oil bottoms from the shale oil atmospheric distillation column will be directed to a delayed coking facility to thermally crack this heavy oil fraction to a lighter material. This cracked material will be recycled back to the distillation unit.

We expect that approximately 725 tons per day of coke will be produced. A market will be sought for this coke by-product. Conversely, the fuel value of this coke may be utilized internally as a combustion fuel.

The fuel oil product from the plant will be stored in floating roof petroleum storage tanks. Storage capacity will depend upon the product transportation mode chosen to move the product to market. We believe that a pipeline offers the best approach and perhaps can be jointly developed by other shale oil producers.

SECTION II - PROPOSED LOCATION OF FACILITIES

A. Mining Facility

The location of the mining facilities will depend upon the mining technique ultimately chosen. Under the inclined shaft approach, the above ground mining facilities will be located at the entry point for the inclined shaft. Depending on the refinery location, this shaft entry point could be either on-tract or off-tract. Vertical ventilation shafts associated with the inclined production shaft will be on-tract and bored as mining progresses throughout the tract.

In the vertical production shaft approach, the above ground mining facilities will be centrally located on-tract. Under this alternative, the mining operations for tract U-b will be located approximately in the center of the tract in the southern part of Section No. 13 along Evacuation Creek. The enclosed map contained in Appendix A identifies the mining

location for this alternative. Three shafts are required for the underground mine. The production shaft will be centrally located with respect to the other two shafts. The men-and-materials shaft will be located approximately 300 ft. to the east of the production shaft. The ventilation shaft will be approximately 225 ft. to the northwest of the production shaft.

Each of the three shafts will have surface facilities associated with their operation. The ventilation shaft will have intake air fans and a ventilation air heating plant adjacent to the shaft opening. The men-and-materials shaft will have a worker changehouse, staff office facilities, and hoisting facilities adjacent to the shaft opening.

Skip hoisting facilities and raw shale storage will be above and adjacent to the production shaft. Since both the production shaft and the men-and-materials shaft will serve as air exhaust shafts, air pollution control equipment likely will be installed to remove particulate matter from the exhaust air.

B. Location of Refining Facilities

Currently three possible sites have been considered as locations for the retort/refinery complex. These locations are so identified on the Southam Canyon map in Appendix A. The on-tract plant site is in the northern portion of tract U-b and includes the northern part of Section 13, and the southwestern portion of Section 12.

Two alternative plant sites - both off-tract - have been considered. A suitable plant site may be found on private lands which are adjacent to the southern boundary of tract U-b. The western half of Section 36 may prove to contain sufficient flat land for plant development. A third plant location, also off-tract, to the north of tract U-a will be investigated as a possible plant site. There is some concern that mining could not be conducted under major on-tract surface facilities, such as the retort/refinery complex. Further study is required before any conclusions can be reached regarding this matter.

It is possible that refinery facilities could be developed to jointly serve the development of both tract U-a and U-b.

C. Retorted Shale Disposal Site

Two possible retorted shale disposal sites are proposed on the map in Appendix A. The first area is in the southern and western area of tract U-b. This area is significantly remote from the White River, yet is nearby to the mine site and to the on-tract refinery location alternative discussed in Section B above. Lessee (U-b) anticipates that the initial disposal on retorted shale would occur predominately in Section 26 of the proposed site and gradually proceed east and north as additional land is needed. Eventually, disposal might proceed across Evacuation Creek onto off-tract lands in Section 25 and 30. A second retorted shale disposal area is off-tract, located approximately three miles to the southwest of the first site.

Additional engineering and environmental studies will be required before a specific disposal site can be chosen. Lessee (U-b) is specifically concerned that the water run-off from the disposal site be impounded so that no significant amounts of salty leachate can pass through the disposal area and eventually flow into the White River. This may require some culverting of intermittent flows in the area and the construction of dams in other areas.

The location of the disposal site is a critical environmental parameter that requires considerable surveying and detailed evaluation prior to a firm site situation. Thus, the sites designated on the map in Appendix A should be viewed as very preliminary, subject to critical study and comparative evaluation. The Rehabilitation Plan discussed in Part 3, Section II-A, indicates that grading, planting and long-term rehabilitation efforts will be conducted on these sites. There would appear to be some operating and environmental advantages to having the retorted shale disposal site, the mine site, and the retorts in close proximity to each other. This will minimize shale transport and may eventually provide the opportunity to more easily dispose of retorted shale underground as described earlier.

D. Support Facilities

The general support facilities such as parking lots, administrative offices, warehouses and shop facilities are planned in the refinery complex. Satellite facilities may be developed at a central location in the disposal site area and

the mining area.

Power generation requirements for the mining facility and the refinery operation are estimated to be at least 55,000 KWH. Due to the fact that U-b and U-a are adjacent tracts, we believe that an area-wide study will be required to properly develop power supplies to serve the area. The retorting/refining complex will generate low BTU gas, pipeline quality gas, and coke, all of which might be considered as a fuel source for a nearby power plant. Such a plant could serve shale oil needs as well as meet additional power requirements in the area. An alternate approach - generating refinery and mine site power requirements at the refinery site - will be considered. In this case, waste heat from the power generating unit could serve as pre-heaters for plant process units. In this manner a totally integrated power generation processing complex could be developed to exclusively serve the mine and refinery needs. It is currently not possible to indicate a preference for an on-tract or off-tract location for power generating facilities.

E. Water Requirements

The proposed plant supporting U-b development requires that water be piped from the White River. White River flow in this area is approximately 700 cfs. The actual requirements for the 50,000 B/D plant are estimated to be approximately:

	Acre Feet/Yr.	Cubic Feet/Second
Mining	150	0.2
Retorting	3,000	4.15
Disposal	1,500	2.1
Upgrading	3,600	5.05
	8,250	11.5

Because of the importance of water rights in the Unitah Basin, the development of oil shale properties in the area require a coordinated approach. As is discussed in Interior's EIS, "some 107,000 acre-feet of water annually is potentially available from the Green, White and Yampa Rivers for development of oil shale..." (Vol. I-II-221). Utilization of this water for large industrial development will likely require construction of dams and reservoirs.

There likely will be some process water effluent produced from the retorting, refinery process water streams, and cooling tower blowdown. If possible, we expect to utilize this water, after suitable treatment, for use in the shale disposal program. The retorted shale will require wetting prior to compaction. Also, water will be required for irrigation purposes in the revegetation plan.

F. Manpower Requirements

Manpower requirements are estimated below for two phases of operation. The first phase concerns the exploration, baseline monitoring program, and facility construction requirements. The second phase relates to the mining

operation during the normal production operations and personnel to continue the routine environmental monitoring program.

During the first phase of tract development, there will be the equivalent of 8-10 full-time people collecting environmental baseline data and conducting exploration and coring activities. The number of personnel working in the area will increase substantially during 1977 when the mine and retort construction activity begins. The production shaft will be started first and will require approximately 30* construction personnel during 1977. Approximately 500 construction personnel will also begin work on the refinery complex in 1977. During 1978 construction of the men-and-materials shaft and the ventilation shaft will be completed and work will begin on retort construction. This will increase the total number of personnel working to approximately 1,065. During 1979, activity will consist of pre-production mining (6-8 panels) and construction of the retorts, refinery, crushers, and tanks. The average number of construction personnel in the area during 1979 is estimated to be 1,375. During the construction phase, the manpower will be largely short-term. Approximately 2 1/2 years will be required to construct the refinery complex. Build-up of construction personnel will begin in 1977 and will reach a peak in 1979. Construction personnel build-up is indicated as an annual average requirement and does not reflect peak requirements that may occur during the year.

The second phase of operations on U-b will be normal production mode operation. This is estimated to require

* Manpower estimates are based on vertical mine shafts.

435 personnel for mining operations and 135 personnel involved in the primary and secondary crushing operations. Approximately 250 people will be required for the retort/refinery operation. In addition, 75 people will be required for the retorted shale disposal and rehabilitation program. We estimate that the equivalent of 2-3 full-time employees will be required to continue the environmental programs. A summary chart of manpower requirements is found in Appendix E.

G. Access and Transportation Plans

A primary all weather, hard surface road (State Route 40) extends from Vernal, Utah, southeastward across the Green River to State Route 45, which goes directly south to Bonanza, Utah. From a point just north of the White River the road becomes a light-duty, all weather, road with improved surface. This road passes through the eastern section of tract U-b and proceeds southeast to Route 207. The leasing stipulations indicate that existing road surfaces should be utilized where possible in development of the prototype lease sites. Under these guidelines Route 45 will have to be improved to bear heavy-duty traffic. The bridge crossing the White River at the Ignatio Stage Stop will also have to be inspected to determine if the structure can support heavy-duty traffic.

Other modes to meet the needs of heavy-duty transportation will be investigated. We note that the Denver and Rio Grande Western Railroad is approximately 60 miles to the south of oil shale development in Unitah County. This same line - on a

spur to Sunnyside, Utah - approaches within 60-65 miles to the west/southwest of tract U-b. Access through this approach would have to consider the appropriate by-passing of Desolation Canyon.

We anticipate that distillate fuel product in the amount of 50,000 B/D will be transported via pipeline. Two major by-products from the plant, ammonia and sulfur, will be transported by truck to markets in the tri-State area. Coke may also be transported by truck. Truck transport would be utilized in lieu of the development of a railroad spur to serve the area.

SECTION III - SCHEDULE FOR DEVELOPMENT

A. Exploration, Coring and Environmental Baseline

Lessee (U-b) will initiate activity on the tract and plant site area in the summer and fall of 1974. This activity will be primarily directed toward the development and installation of various monitoring stations for baseline data collection. Test well drillings and surveying will be conducted; air and water monitoring stations hopefully placed and operating prior to the winter season (1974-75). Prior to obtaining an approved detailed plan, our preliminary activity on the tract will be governed by CFR Title 43 Part 23 concerning surface exploration, mining and reclamation of public lands. The bar chart in Appendix C indicates the activity and timetable proposed in order to prepare and submit a detailed development plan.

B. Approved Development Activities

By the end of the last quarter of 1976, we hope to have a detailed development plan approved so that full-scale construction activity could begin. During 1975-1976, we expect to file the various construction permit applications and seek other governmental permits required to begin work both on-tract and off-tract. These applications may include road and pipeline right-of-way permits.

The first major construction activity to occur will likely be the sinking of the mine production shaft. In the vertical shaft case, this shaft is 300 feet deeper than the other two shafts, due to the fact that the primary crusher is at the base of the shaft. The inclined shaft will also require approximately two years construction time due to the increased length of the shaft. The bar chart in Appendix D indicates the timetable for the entire oil shale development program for tract U-b.

C. Community Planning Coordination

The graph in Appendix E summarizes the manpower requirements of the oil shale development activity as concerns tract U-b. We have not calculated, for purposes of this preliminary plan, the actual population increase to the area due to the tract development. A good deal of the manpower requirements through 1979 will be transitory in nature, closely associated with a specific construction activity. Manpower requirements are shown as annual averages and do not

designate temporary peak requirements that will occur during the year. Manpower requirements after 1979 will be permanent requirements associated with routine oil production. We believe it to be imperative that area-wide community planning begin immediately. We believe that industry's role should be one of coordination and support in working with State and local officials and a reputable community development contractor. Also, since U-a and U-b are adjacent sites, the community development plans likely will include mutual manpower and community requirements.

PART 3: ENVIRONMENTAL CRITERIA

SECTION I - BASELINE OF MONITORING PROGRAMS

INTRODUCTION

Part 3 of Lessee (U-b)'s Preliminary Development Plan concerns the plans and procedural activities that must be completed in order to comply with the Oil Shale Lease Environmental Stipulations as specified in the Federal Register, Vol. 38 No. 230, November 30, 1973, pp. 33185 to 33199.

It is our current judgment that many of the Environmental Stipulations specified in the Oil Shale Lease Program can be best accomplished by hiring a contractor to develop the environmental baseline data and related programs. The accomplishment of the environmental stipulations requires ready access to skilled experts in such disciplines as geology, meteorology, archeology, and environmental assessment. As in many environmental matters, interdisciplinary interactions must be accomplished routinely in close working relationship with experts. We have made initial contact with consulting firms and believe that a reputable contractor can be chosen to perform the necessary services. Lessee (U-b) is fully aware that agents, contractors, and subcontractors must comply with Lease Stipulations; failure to do so shall be deemed failure or refusal by Lessee (U-b).

In order to implement the approach regarding environmental criteria indicated above, Lessee (U-b) has developed the following timetable:

2nd-3rd Quarter 1974	Select contractor and prepare for baseline monitoring program.

3rd-4th Quarter 1974	Begin baseline monitoring program.
4th Quarter 1975-1st Quarter 1976	Complete 1st year baseline monitoring, submit detailed development plan.
1st Quarter 1976	Continue 2nd year baseline program.
By 4th Quarter 1976	Obtain approval of detailed development plan.

Section 102(C) of the National Environmental Policy Act requires "...the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved." Vol. IV of the Interior's Environmental Impact Statement, Chapt. I D indicates the broad basis of contact that has been established. Lessee (U-b) believes that many of these same Federal and State agencies must be recontacted by the tract lessee during the preparation of the detailed development plan. Such contacts likely will include:

Bureau of Land Management
Bureau of Reclamation
Bureau of Sport Fisheries and Wildlife
Bureau of Outdoor Recreation
U.S. Geological Survey
Soil Conservation Service
Park Service
State of Utah Agencies
Environmental Protection Agency

It is only with a broad area of contact and coordination that a comprehensive and thorough detailed development plan can be prepared.

A. Air Quality

Pursuant to the lease environmental stipulations, at least three ambient air monitoring stations will be strategically located to monitor sulfur dioxide, hydrogen sulfide, and suspended particulates. Pursuant to the lease environmental stipulations, additional pollutant monitoring will be conducted where the Mining Supervisor determines that such monitoring is necessary. At least one additional monitoring station will be located at the point of expected maximum concentrations of these same pollutants. We expect that it will be extremely difficult to determine - by dispersion modeling - the expected point of maximum concentration. This is due to the mountainous terrain and air mass mixing that occurs in the area.

During the 3rd and 4th quarters of 1974, our major emphasis will be specifying, purchasing, and setting in place the analytical equipment necessary to maintain at least four air monitorings. Where possible, automatic, continuous recording instruments will be utilized. Procedures for calibration, maintenance, and data collection will be developed. Our preliminary contacts indicate that delivery time may be lengthy on some of this specialized equipment. Thus, selections must be made quickly in order to start the program by the 4th quarter 1974. As indicated earlier, Lessee (U-b) plans to utilize a contractor to perform the air quality baseline monitoring program and to assist in the data preparation for the detailed development program. As the level of Lessee (U-b) staffing increases in the area, we expect to gradually acquire

(from the contractor) the performance of routine surveillance operations that concern the air monitoring program and the meteorological monitoring program.

At least one meteorological station will be located in near proximity to each plant site. A meteorological station will record wind direction and speed and relative humidity at 3 levels - ground level, 30 feet and 100 feet. Air temperatures also will be recorded at these positions. Rainfall data will be collected at the meteorological station and consideration given to establishment of additional rainfall monitoring stations at other tract locations. Meteorological conditions in the tract area indicate that summertime thunderstorms could contribute to flash flood conditions in natural drainage ditches. Although the Utah U-b site is generally classified as an arid to semi-arid region, the isolated heavy rainfall from summertime storms may require monitoring in order to assure that run-off from shale disposal sites is adequately contained. Containment practices generally will consist of draining or damming the run-off water at the retorted shale disposal site.

1. Air Pollution Potential From Mining and Crushing of Oil Shale

The mine ventilation air from a shale oil underground mine designed to support a 50,000 B/D plant will be about 2,500,000 cfm. Assuming that scrubbing to remove airborne dust and particulate matter is necessary, the mine ventilation exhaust could contain 20 pounds of dust per hour. This quantity of dust will increase briefly due to

blasting operations and might average 25 lbs./hour (Vol. I, III-122). These emission data are preliminary estimates based on data presented in Interior's EIS, Vol. I, III-122; comparable data have not yet been developed for our preliminary mining plan.

Since the Paraho technology does not require a finely divided oil shale feed, the emissions from the crushing, conveying, and storage operations are expected to be held within manageable proportions. Additional experience on the Paraho unit will provide a basis for developing emission factors on dust and particulate emissions.

2. Air Pollution Potential From Retorting

No direct emissions are expected from the Paraho retort operation. Overhead gases will be collected and utilized as a low BTU fuel gas. Since the Paraho retort does not require a finely divided oil shale feed, the shale that exits from the bottom of the retort is not expected to be a significant source of fugitive dust. Similarly, the conveying of the retorted shale to the shale disposal site is not expected to emit significant quantities of fugitive dust.

3. Air Pollution Potential From Shale Oil Upgrading

As discussed earlier in Section I-E, Part 2, shale oil must be upgraded to reduce pour point and lower the levels of nitrogen and sulfur in the final product. A number of alternate approaches to refine this raw shale

are possible. One typical case (Appendix B) refines the crude shale oil to a low sulfur, low nitrogen distillate fuel oil. The sulfur and nitrogen compounds present in the crude shale oil are first converted into H_2S and NH_3 by catalytic hydrogenation. These two gases are then separated and converted into the by-products sulfur and ammonia. Sulfur oxide (SO_2) emissions will occur from two general sources during refining: sulfur plant emissions, and fuel fired furnace emissions. Using the best available control technology on the sulfur plant, 99.5% of the input sulfur can be recovered. A tail gas treating unit on the sulfur plant will effectively minimize SO_2 emissions to the lowest practical level. Low BTU gas also is used to fire boilers and furnaces for the refinery operation. These process gases will be desulfurized prior to combustion to conform to applicable environmental requirements.

In order to actually develop adequate air quality baseline data, we believe a coordinated approach to ambient air monitoring is required. Rather than concentrating as many as eight ambient air monitoring systems in the specific U-a/U-b area, we believe it advisable to disperse these stations throughout the geographic area in a network of monitoring sites. Such a plan would require a coordinated approach by Federal, State, and local governments and private industry. We are aware that the Federal EPA is currently conducting a research program directed toward the design of an optimum network for ambient air monitoring.

Furthermore, we believe that a coordinated program can be jointly developed to measure baseline air quality over a widespread geographic area and then monitor any changes that occur to the air quality as a result of prototype shale oil development in the area. Such an approach de-emphasizes the need to determine the point of maximum pollutant concentration and substitutes a wide network of air monitoring stations. Hopefully such an approach will not require any more than 4 stations per lessee, but will improve the overall monitoring approach.

B. Water Quality

1. Surface Water

The White River forms a portion of the northern boundary of Utah tract U-b; mean flow of the river in this area is 700 cfs (EIS: Vol. III-II-92) and it is recognized as the only perennial stream. Tract U-b is semi-arid with annual precipitation of approximately 10 inches per year. Evacuation Creek extends generally northward through tract U-b and joins the White River. A number of minor drainages from U-b flow into the White River and Evacuation Creek. Surface flow in these drainages is expected during the summer months after local thunderstorm activity and in the spring months during snow melting periods.

A gauging and sampling station on the White River is just north of tract U-b (Station No. 3065 - EIS: Vol. I-I-99). Consideration should be given to establishing an additional station on the White River downstream from

tract U-b. This will be off-site of tract U-b and probably should be downstream from the point where Southam Canyon intersects the White River.

Exclusive of the White River flow adjacent to tract U-b, there apparently are no other streams with year-round flow. After a thorough inspection is completed, we would expect to identify drainage flows that might be considered "downstream" of oil shale operations, especially the retorted shale disposal site. Although the retorted shale disposal site run-off will be dammed to contain run-off, it may be prudent to establish water monitoring stations in specific wet weather drainage areas. A potential location for such a station is the Evacuation Creek area, as it approaches the White River. Such a location would record precipitation and, where possible, record streamflow, pH, total organic carbon, and water temperature. Periodic analysis for selected organic and inorganic chemical constituents could also be made. Baseline data on surface water will be collected for at least one full year prior to the submission of the detailed development plan.

2. Ground Water

Little detailed information is available on the extent of ground waters present in and around tract U-b. It is generally concluded that ground water supply is small and that mine water seepage should be easily controlled (EIS: Vol. III-II-94). One test hole in Unitah County (WOSCO Ex. 1) indicated water production

in two zones: 2729-2809 feet and 2901-2429 feet. Average discharge was low in each of the tests conducted (EIS: Vol. I-II-227). Lessee (U-b) plans to bore a test well at the proposed mine site and install an observation well in each water bearing zone defined by the test well. A drilling and sampling program for these wells will be developed in accordance with the Mining Supervisor and the lease environmental requirements.

C. Fauna and Flora

1. Fauna

Utah tract U-b is essentially a primative land area. As part of the Uinta Basin, it may provide a temporary habitat for animal life. Uinta Basin provides over a million such acres of land and many small and big-game animals utilize this primative area.

The Interior's EIS identified certain areas in Utah as having primary importance to Mule Deer. These areas are generally 75-100 miles to the west of tract U-b and 30-75 miles to the north and east of U-b (Vol. I-II-64). Primary habitat of the Elk is located 100 miles to the west of tract U-a and also to the north of U-b. Elk winter feeding grounds are far to the north of U-b in Wyoming. Antelope have been transplanted into the Uinta Basin and areas just to the north of tract U-b are identified as natural antelope habitat (Vol. I-II-65). Bears have been reported in the Uinta Basin, but are considered scarce. Mountain lions exist in the area, but the population status is

uncertain (Vol. I-II-231). The Bureau of Land Management estimates that a herd of about 130 wild horses inhabit the Utah oil shale lands.

Many small animals exist in the oil shale area. These include coyotes, porcupines, bobcats, muskrats, beavers, minks, jackrabbits, and cottontails. Cottontails are judged to be the more important small game in the area.

Waterfowl, wild turkey, sage grouse, doves, chukar partridges, song birds, eagles, and prairie falcons are known to reside or migrate through the area. Key habitats for turkey and sage grouse were identified in the EIS Utah tract U-b as being approximately 25 miles from any identified habitat area (Vol. I-II-67).

Water quality in the White River supports catfish. Fish hatcheries or fishing impoundments areas are not identified within 30-40 miles of tract U-b. Oil shale development on tract U-b is not expected to significantly alter the water quality of the White River.

As part of the detailed development plan, Lessee (U-b) will submit a Fish and Wildlife Management Plan. The plan will present the results of a baseline survey of fish and wildlife activity in tract U-b. It is expected that fish studies will be limited to the White River, as this is the only perennial stream in the U-b tract. The survey will define wildlife activity on tract U-b and will present a plan to avoid or, where avoidance is impractical, minimize damage to fish and wildlife habitat. The baseline study

from 10-20%.

Loamy Saltdesert occurs in only 5% of the total tract area. Many of the plants occurring in the above two categories are typically found in this soil type.

The remaining 15% of the land in U-b consists of the rough broken land of the canyon walls. Only a sparce growth of juniper, big sagebrush, black sage, etc. is in this area.

Some cattle and sheep are known to graze on tract U-a and U-b. Two poisonous plants, locoweed and halogeton, can cause severe problems with livestock.

Lessee (U-b) plans to confirm the types and quantity of vegetation present in tract U-b as part of the baseline program to establish conditions prior to development in tract U-b.

D. Historic and Scientific Values

Currently there are no known historic, archaeological or scientific sites on tract U-b. The National Register of Historic Places as published in the Federal Register, Vol. 39 No. 34. February 19, 1974, notes that Desolation Canyon is a so-designated site and is partly in the southwest portion of Uintah County. Desolation Canyon is roughly 40 miles southwest of tract U-b. No other sites in Uintah County are noted in the National Register. The National Register lists no such sites for Rio Blanco County, Colorado, which is directly east of Uintah County. Dinosaur National Park is approximately 35 miles to the north of tract U-b. Approximately one mile to the north of U-b there is a site of some historical importance (Ignatio Stage Stop). Adjacent to the southern boundary of U-b are the abandoned mining sites of

Rainbow and Watson. Lessee (U-b) plans to re-examine tract U-b to determine if any significant sites of historic or scientific importance might have been overlooked and therefore unreported in Interior's EIS. This investigation will be done by personnel professionally skilled in such an investigation and in accordance with National Register Criteria of Evaluation for Historic Preservation. Contact will also be established with the Director, Utah Department of Development, who is designated as Utah State Liaison Officer for State Activities under the National Historic Preservation Act of 1966. The investigation shall be especially concentrated in areas selected for retorted shale disposal and plant development.

E. Soil Survey and Productivity Analysis

Lessee (U-b) anticipates that baseline study of soil conditions and productivity will be conducted by a suitable contractor. Through the soil survey program, soil samples will be collected and analyzed in order to provide an orderly scientific inventory of soil resources according to their potentialities and problems in use. Suitable maps, tables, and reports will be prepared to characterize the soil condition prior to development.

In order to determine productivity of specific soil types, a standardized revegetation experiment may be conducted on virgin soil types. Such an approach will be used to determine the productivity of specific soil types prior to land development. This planting experiment will utilize plants native to the area and will measure plant survivability and growth on undisturbed

soils on tract U-b.

F. Baseline vs. Monitoring Activity

The environmental stipulations of the prototype leasing program require two important - and in some ways - separate requirements for environmental assessments. The baseline setting, as described above, consists of a two-year program of measurement to determine the undisturbed environmental conditions prior to any significant development of tract U-b. This baseline setting consists of measurements of air quality, water quality, soil conditions, and animal counts to determine a base or control value against which future conditions can be compared.

The environmental monitoring program represents a follow-up program to record and assess any changes that may occur in environmental parameters as a result of oil shale development. The monitoring program will detect changes that occur due to a construction activity and normal production mode activity. In many cases the results of the on-going monitoring program may be directly compared to baseline measurements. However, the results obtained in the monitoring program will aid in the development of trend data regarding changes that could occur in environmental conditions. In this regard, Lessee (U-b) views the environmental monitoring requirements as an important program designed to assess the long-term environmental impact of oil shale development.

During 1980 we expect to begin production of distillate fuel oil and by mid-year reach plant capacity. During this period we plan to conduct an environmental audit of mine and

and refinery operations to confirm that the actual air, water, and solid waste discharges are in compliance with all applicable Federal, State, and local environmental regulations. This audit will consist of both an administrative audit, and an actual sampling and analysis of air and water discharges. The administrative audit will be concerned with the conformance to various environmental permit conditions, procedures, and environmental plans; the effluent sampling and analysis audit will actually sample the various water and air discharge points and confirm that the emissions comply with design criteria and all applicable environmental regulations. This audit may be coincidental to the various production mode tests required by environmental permits and new source performance standards.

SECTION II - ENVIRONMENTAL PLANNING

The development of oil shale on tract U-b will, by necessity, cause changes in environmental conditions. However, Lessee (U-b) believes that comprehensive environmental planning prior to development will minimize environmental impacts and will "encourage productive and enjoyable harmony between man and his environment," as is the nation's policy as defined in The National Environmental Policy Act of 1969.

This section is concerned with the environmental planning associated with oil shale development.

A. Rehabilitation Planning

Probably the major environmental concern is the disposal of retorted shale and rehabilitation of disposal

sites. At least during the initial years of plant operation, the shale will be disposed of above ground. One of the major concerns in any land rehabilitation plan is the early identification of future uses for the rehabilitated land. Our current information suggests that the land in and surrounding tract U-b will remain primitive and very sparsely populated. As population increases in near-by areas, one might anticipate that the tract area will find greater use for recreational value such as camping and hiking. Thus, rehabilitation plans should emphasize retorted shale disposal and rehabilitation in a manner that perpetuates use of this land for primitive recreational value. Prior to development of a rehabilitation plan, we will seek the advice of the Bureau of Land Management and the appropriate agencies within the State of Utah government.

The proposed retorted shale disposal sites are largely located on Federal lands. Retorted shale will be transferred to the disposal site from the retort area by truck and/or conveyor. The retorted shale will be graded, compacted, and contoured in order to blend into the natural contours of the land. Slopes will generally rise less than one foot in four to insure stability of the shale pile. The consistency of the shale from the Paraho retort is expected to be coarse and should not be a significant source of dust. Once an entire area is graded and compacted, provisions will be made to control run-off and collection of leachate.

Revegetation of disposal sites will be initiated as

soon as practical to minimize the time that the land is in a disturbed condition. Nominally, revegetation plans will key to an annual spring or fall planting of native grasses and bushes. Supplemental watering and fertilizer addition will follow. Lessee (U-b) also plans to conduct studies (and possibly support additional research studies at the university level) directed toward acceptable revegetation of retorted shale sites. One currently unknown parameter is the revegetation characteristics of Paraho-retorted shale. We expect the texture of this retorted shale to be more granular and coarse than shale produced by the TOSCO II process. Coincidental with the development studies in Paraho technology, we plan to conduct initial revegetation studies on the shale from the Paraho retort. Results from such studies will be available for inclusion in the Revegetation Plan as submitted in the detailed development plan.

A plan for erosion control will be prepared and included in the formal rehabilitation plan. One aspect of this plan concerns the control of high salinity leachate from disposal pile run-off. Sources of this leachate are expected from natural storm water run-off and from artificial watering to enhance revegetation. The run-off water will be impounded at the downstream base of the disposal pile. From this impoundment, the water will either be transferred to a process water storage pond or reused directly as process water.

A second aspect of erosion control concerns a plan for compacting, contouring, and planting to insure that the retorted shale pile will remain stable over long periods, and will not seriously erode during periods of thunderstorm activity.

The detailed development plan will contain the formal Rehabilitation Plan. Prior to submitting and obtaining an approval of the detailed plan, any request to conduct exploration activity on U-b will be accompanied by a specific rehabilitation and erosion control program covering such exploration activity. Such exploration activity, together with the rehabilitation program, will be conducted under Part 23 CFR - Surface Exploration, Mining, and Reclamation of Lands.

It is important to note that the final Rehabilitation Plan will be developed after consultation with Federal and State of Utah personnel. The Soil Conservation Service has direct responsibility in this area and we plan early and frequent contact with this agency. This is an important environmental concern that requires joint discussion, planning, and coordination prior to plan development. Also, due to the proximity of tract U-a and near-by private lands held for oil shale development, a consideration of area rehabilitation plans is required in development of U-b plans. In this regard a single shale disposal site serving tract U-a and U-b is also a logical consideration.

B. Oil and Hazardous Materials

Lessee (U-b)'s plan for oil and hazardous materials will be prepared in accordance with National Oil and Hazardous Substances Pollution Contingency Plan and the Oil Pollution Prevention regulations. It is our understanding that the National Oil and Hazardous Substances Plan is directed toward Federal agencies and provides for an integrated Federal/State government response in order to protect the environment from the damaging effects of pollution discharges. Lessee (U-b) plans to cooperate fully with Federal/State agencies in order that they will be able to fulfill their responsibility under this regulation.

Lessee (U-b)'s major effort will be directed toward preparation of Spill Prevention Control and Countermeasure Plans (SPCC Plan) as described by the Federal EPA Oil Pollution Prevention regulations applicable to Non-Transportation Related Onshore and Offshore Facilities. These regulations establish procedures, methods, and equipment to prevent the discharge of oil into or upon navigable waters of the United States. The White River, which generally forms the northern boundary of tract U-b, is considered navigable water of the U.S. Furthermore, the definition of navigable waters* is being interpreted very broadly to include dry wash flows that flow seasonally or intermittently after a heavy rain and subsequently flow into other navigable waters (e.g. the White River). On this basis, the U.S. Geological Survey maps of tract U-b indicate many miles of intermittent streams

* U.S. EPA - Office of Enforcement and General Counsel - letter dated December 5, 1973 to Director Enforcement Division Region VIII.

that flow during snow melting or heavy shower conditions. The majority of these wet-weather run-off flow into the Evacuation Creek area and ultimately may flow into the White River.

Lessee (U-b) intends to develop an SPCC Plan for any facility that could reasonably be expected to discharge oil into intermittent streams or the White River. These plans will be developed in accordance with existing (or amended) regulations as described in the December 11, 1973 Federal Register. An SPCC Plan will be developed for crude shale oil storage, finished product storage, and any process unit that may reasonably have a damaging oil spill. We also believe that there may be other liquids generated at the oil processing site that may require contingency planning in the event of an unexpected spill. Also, our current refining plan produces substantial ammonia as a by-product; a spill contingency plan will be considered for this material.

C. Fish and Wildlife Plan

A Fish and Wildlife Management Plan will be submitted as part of the detailed development plan. Generally, we believe that tract U-b does not serve as a primary habitat for wildlife. However, tract U-b likely does serve as a transitory site for limited wildlife use. The baseline monitoring survey will provide data on wildlife species, distribution, and abundance. It will be the goal of the wildlife management plan to minimize the impact of oil shale operations on the wildlife found on U-b. Such a plan will avoid damage to wildlife where practicable and provide

alternate habitats where disruption is unavoidable.

The Fish and Wildlife Service within the Department of Interior has direct responsibility and will be contacted early in the development of baseline data and plan development. Lessee (U-b) anticipates that the baseline and early years of the monitoring program will be conducted by a contractor in order that professional and experienced personnel can be employed in the study.

SECTION III - ENVIRONMENTAL REPORTING

The chart in Appendix C indicates the steps necessary to prepare the detailed development plan for tract U-b. It is anticipated that work on the tract site could begin by September 1974. Exploratory work on the tract will be conducted only after approval of the Mining Supervisor and under CFR Part 23. The target date for submission of the detailed development plan is the 4th quarter 1975 to 1st quarter 1976. This allows 9 months to obtain approval of the plan and hopefully will insure having an approved plan prior to the third anniversary date. The second consecutive year of baseline environmental data will be gathered and reported after the detailed development plan has been submitted. The detailed development plan will be modified as necessary, as a result of study of the additional baseline data.

After obtaining approval of the detailed development plan, an annual report will be prepared for the Mining Supervisor on the following lease anniversary dates. This report will indicate the status of programs defined in the detailed plan. This annual report will also contain the information generated in the ongoing environmental

monitoring program.

Lessee (U-b) will provide environmental briefings as specified in the environmental stipulations of the prototype leasing program.

Appendix A

Southam Canyon - Overall Site Development

Appendix A

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PRELIMINARY DEVELOPMENT PLAN for OIL SHALE ACTIVITY on UTAH TRACT U-b

SOUTHAM CANYON QUADRANGLE
UTAH—UINTAH CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

ALTERNATIVE PLANT SITE

TRACT U-b

REFINERY RETORT SITE

MINE SITE

CONVEYOR/ACCESS ROUTES

POSSIBLE RETORTED SHALE DISPOSAL SITE

INITIAL FILL

ALTERNATIVE PLANT SITE

POSSIBLE RETORTED SHALE DISPOSAL SITE

Designated development sites are preliminary locations only. A detailed study is required to fully evaluate these and other alternative locations.

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1965. Field checked 1968

Polyconic projection. 1927 North American datum
10,000-foot grid based on Utah coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue

SCALE 1:24 000

1 MILE
1 KILOMETER

CONTOUR INTERVAL 40 FEET
DOTTED LINES CROSSING RIVERS REPRESENT 20-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

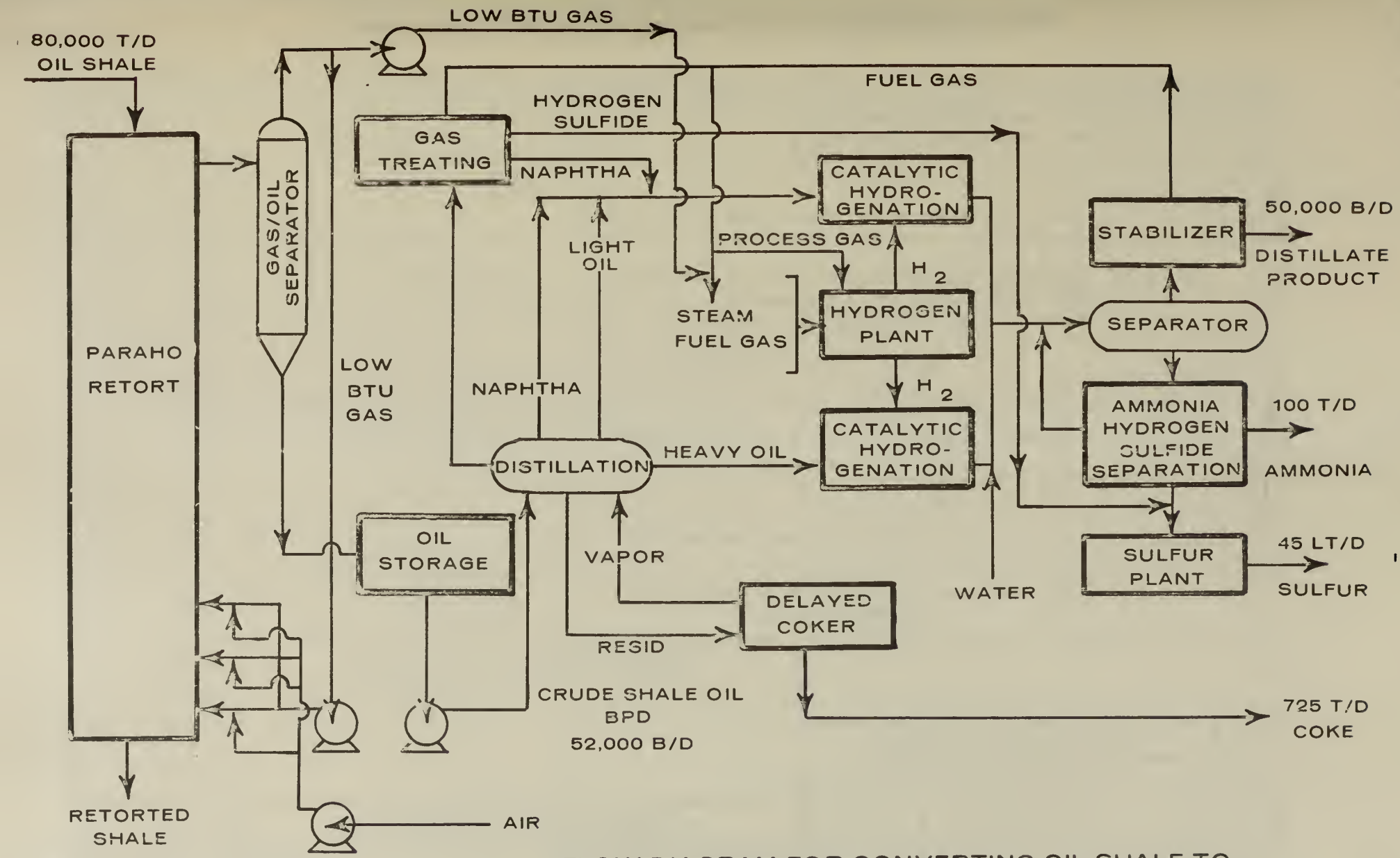
ROAD CLASSIFICATION
Light-duty road, all weather, improved surface
Unimproved road, fair or dry weather
State Route

UTM GRID AND 1968 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

UTAH
QUADRANGLE LOCATION

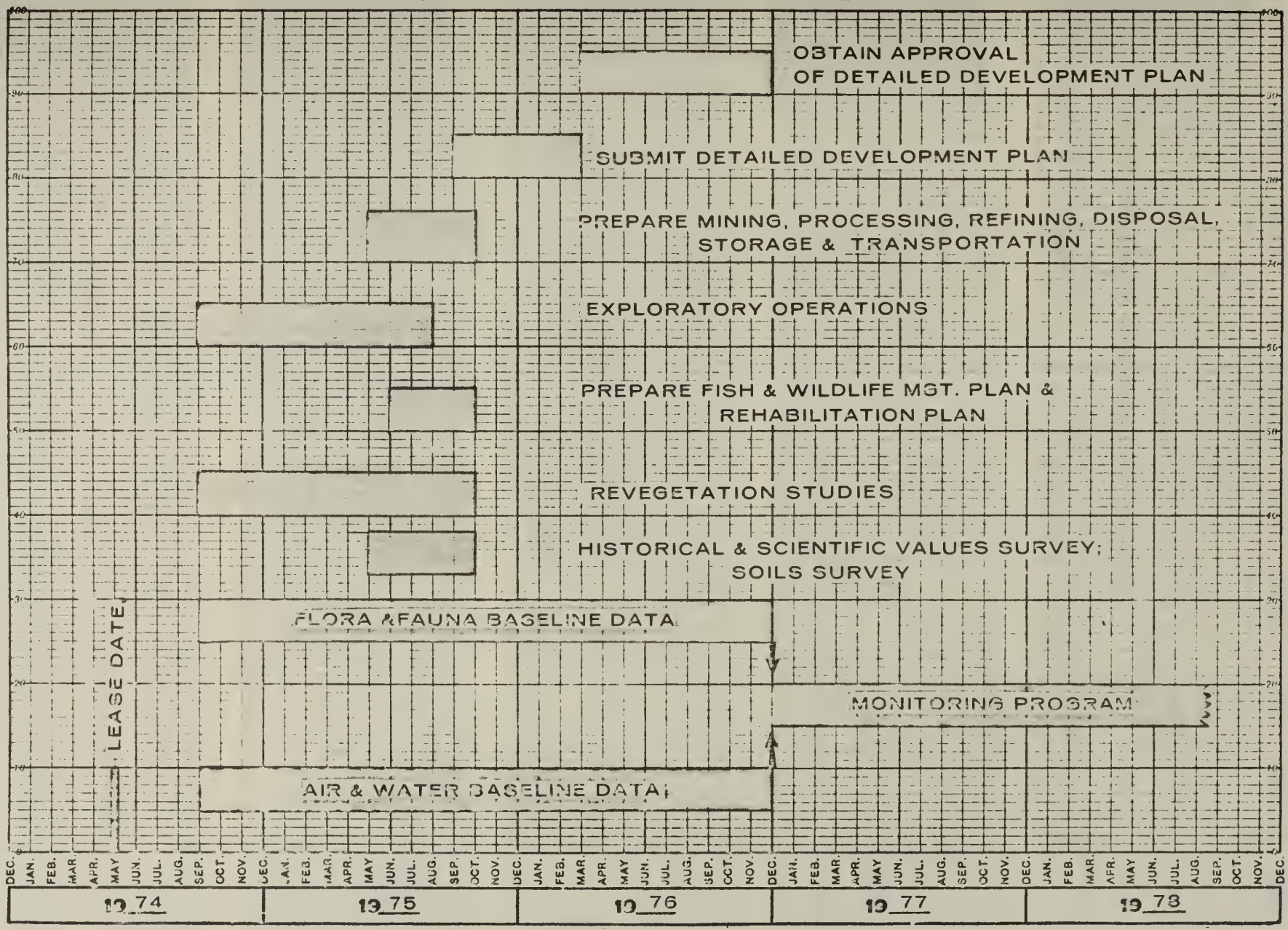
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR WASHINGTON, D.C. 20242
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

SOUTHAM CANYON, UTAH
N3952.5—W10907.5/7.5
1968
AMS 4163 I NW—SERIES V897

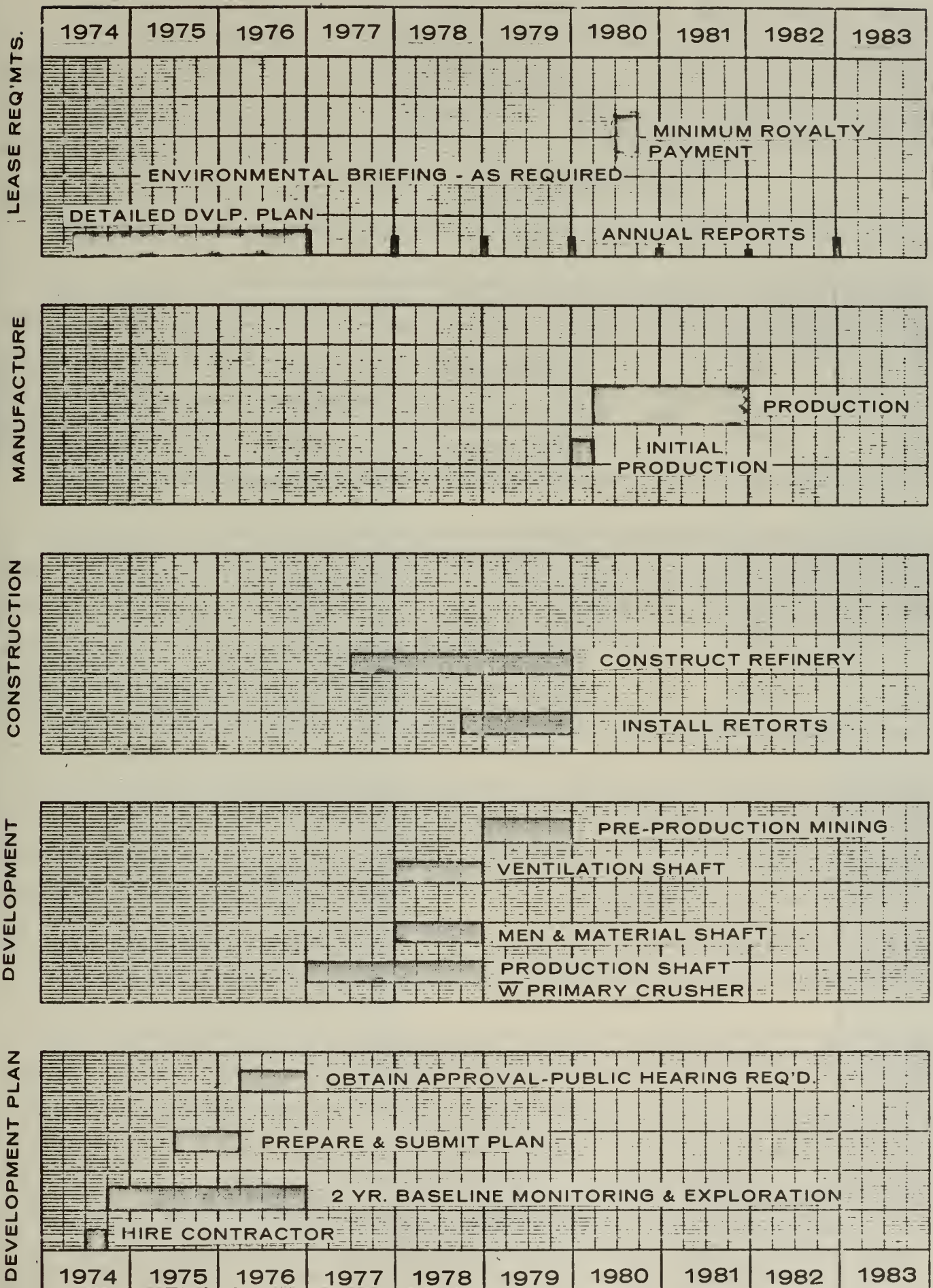


FLOW DIAGRAM FOR CONVERTING OIL SHALE TO LOW SULFUR DISTILLATE FUEL OIL

PREPARATION of the DETAILED DEVELOPMENT PLAN



TRACT U-b OIL SHALE DEVELOPMENTAL PROGRAM



MANPOWER REQUIREMENTS BY FUNCTION

APPENDIX E